A-64-625 #3

Final Report for Period: 08/2006 - 07/2007 **Submitted on:** 07/30/2007

Principal Investigator: Frost, J. David .

Award ID: 0332613

Organization: GA Tech Res Corp - GIT

Title:

InfinitEnergy: A Coastal Georgia Partnership for Innovation

Project Participants

Senior Personnel

Name: Chameau, Jean-Lou

Worked for more than 160 Hours: Yes

Contribution to Project:

Name: Frost, J. David

Worked for more than 160 Hours: Yes

Contribution to Project:

Name: Brown, Carlton

Worked for more than 160 Hours: Yes

Contribution to Project:

Name: Parekh, David

Worked for more than 160 Hours: Yes

Contribution to Project:

Name: Baxter, Carlise

Worked for more than 160 Hours: Yes

Contribution to Project:

Name: Hunt, Mary

Worked for more than 160 Hours: Yes

Contribution to Project:

Mary Hunt acts as project administrator and liaison between all program personnel and offices. Outreach activities in the Atlanta area/main campus and overall team projects related to grant writing and resource development are managed by Ms. Hunt. She works in a part-time capacity and most of her salary is covered as cost sharing.

Name: Dodd, William

Worked for more than 160 Hours: Yes

Contribution to Project:

Bill Dodd acts as our industry liaison. He is the primary contact for our industry partners generating additional funding and providing a link for technology transfer activities.

Name: Stewart, Susan

Worked for more than 160 Hours: Yes

Contribution to Project:

Research Engineer working on Strategic Technical Analysis for various forms of alternative energy implementation in the Savannah area. She's providing the necessary technical background, including cost analysis and energy efficiency used by project partners in economic development decisions related to the program goals.

Name: Sonnenberg-Klein, Julie

Worked for more than 160 Hours: Yes

Contribution to Project:

Ms. Sonnenberg-Klein is working as the on-site project coordinator for the Savannah area. She is responsible for developing local outreach activities and is the primary contact for our partner academic institutions. She coordinates K-12 initiatives and works on the project team developing new resources and grant writing activities.

Name: Frost, J. David

Worked for more than 160 Hours: Yes

Contribution to Project:

Frost initially served as co-PI on the project and subsequently PI. In these roles, he oversaw the overall project activities and played a lead role in organizing the 2007 NCAR Conference titled 'Energy RX: A Prescription for Security, POlicy and Research'.

Post-doc

Graduate Student

Name: Lu, Karyn

Worked for more than 160 Hours: No

Contribution to Project:

Karyn Lu is a graduate assistant majoring in informational design technology. She is working with the project on our web-site.

Name: Martin, Kirk

Worked for more than 160 Hours: No

Contribution to Project:

Graduate Student working on technical issues for wind turbine optimization.

Name: Golbuff, Samuel

Worked for more than 160 Hours: No

Contribution to Project:

Graduate Student doing technology assessments related to wind speed resources and potential hybrid transportation alternatives.

Name: Melsert, Ryan

Worked for more than 160 Hours: Yes

Contribution to Project:

Ryan is doing his graduate research on the cellulosic ethanol project. He has done extensive literature research on the avilable technology as well as economic and resource assesments.

Undergraduate Student

Name: Schmidt, Michael

Worked for more than 160 Hours: Yes

Contribution to Project:

Mike has worked on wind and wave data analysis for the Georgia coast. He has also investigated the available technologies for ocean/current energy.

Technician, Programmer

Other Participant

Research Experience for Undergraduates

Organizational Partners

Savannah Technical College

As a key InfinitEnergy partner, Savannah Technical College focused on alternative energy related workforce development. The college developed a course on the installation of photovoltaic solar systems. The lead electronics instructor, attended a workshop at the Florida Solar

Energy Center, a nationally recognized institute for photovoltaics education and applications.

Savannah State University

As a key InfinitEnergy partner, Savannah State University undertook a number of focussed educational activities including organizing:
A One Week workshop for middle school students on Careers in Engineering, two days of which were dedicated to renewable energy technologies;
Energy Institute for high school students, a portion of which involved the installation of a solar powered lighting system in Hinesville;
Student presentations of papers at the REAP conference at Florida Solar Energy Center;
Undergraduate research training in renewable energy on campus;
Development of an undergraduate and two continuing education courses.

Coastal Busi. & Education Tech. Alliance

The Coastal Business & Education Technology Alliance serves a strategic role in the Savannah area by providing a forum for and supporting interactions between academic institutions and industry. As an InfinitEnergy partner organization, they provided personnel support in organizing project workshops and community information meetings.

Southern Alliance for Clean Energy

The Southern Alliance for Clean Energy is a not-for-profit, non-partisan organization working with citizens for clean air, clean water and healthy communitites. The collaborated with InfinitEnergy personnel throughout the project in raising public awareness of importance of alternative energy sources.

Southern Company

Sponsored and collaborated with Georgia Tech on a research project to evaluate the potential for an Offshore Wind Energy farm in Georgia. The goal of the project was to determine if offshore wind power is a feasible and efficient renewable energy option for power generation. The project concept included three to five wind turbines that could generate 10 megawatts of power, enough to power about 2,500 homes.

Savannah River National Laboratory

Savannah River National Laboratory co-organized and co-sponsored with Georgia Tech, the 2007 National Conference on Advancement of Research titled 'Energy Rx: A prescription for Security, Policy and Research'. The conference was attended by about 100 participants from industry, government and academia.

Savannah Electric Power Company

Savannah Electric Power Company, an operating unit of the Southern Company with responsibility for the Coastal Georgia region provided $5,000 in financial support to the InfinitEnergy project.

Savannah Economic Development Authority

Savannah Economic Development Authority promoted InfinitEnergy project activities and facilitated access to Savannah INternational Trade & Convention Center for project workshop held during year 1 of project.

Home Depot

Home Depot provided InfinitEnergy team members access to explore potential strateggies for deploying photovoltaic arrays on distribution centers as part of future alternative energy strategy for Savannah.

Skidaway Institute of Oceanography

Instrumentation that was installed and operated by faculty members from the Skidaway Institute of Oceanography provided scientific data that was used as part of the offshore wind assessment project. The data demonstrated that significant higher sustained wind values that previously thought existed off the coast of Georgia and increased the potential viability of a demonstration offshore wind farm being developed.

Other Collaborators or Contacts

Activities and Findings

Research and Education Activities:
See entire narrative report in fastlane section entitled 'attach file.'

Findings:
See entire narrative report in fastlane section entitled 'attach file.'

Training and Development:
See entire narrative report in fastlane section entitled 'attach file.'

Outreach Activities:
See entire report in fastlane section entitled 'attach file.'

Journal Publications

Bulpitt, W.S., Stewart, S.W., Hunt, M.H., Shelton, S.V., "Feasibility of Offshore Wind Power in the South Atlantic Bight", 2006 Offshore Technology Conference ProceedingsPaper: OTC-18351-PP, p. , vol. NA, (2006). Accepted,

Bulpitt, W.S., Stewart, S.W., Hunt, M.H., and Shelton, S.V., "Innovative Partnerships for Offshore Wind Development", Windpower 2006 Proceedings. Session: Offshore Wind - Technical Challenge, p. , vol. , (2006). Accepted,

Books or Other One-time Publications

Web/Internet Site

URL(s):
http://www.gtsav.gatech.edu/infinitenergy/
Description:

Other Specific Products

Contributions

Contributions within Discipline:
InfinitEnergy was developed to become a model for integrating, facilitating, and enabling AET research and development with a goal toward economic development. Using a multidisciplinary systems approach within a collaborative management structure has resulted in an expansion of regional AET developments. Efforts to expand economic opportunities in solar energy, bioenergy, and offshore wind energy have resulted from InfinitEnergy sponsored studies.

Contributions to Other Disciplines:
Because InfinitEnergy is based on an overall multidisciplinary systems approach, it encourages the incorporation of socio-political elements in studies that are based in energy technology development and deployment. In both papers that were published in conjunction with the project (see journal and publications section), there is a secondary emphasis on the policy being developed in parallel with new AET technology.

Contributions to Human Resource Development:

ò The InfinitEnergy Program has created opportunities for undergraduate and graduate students to come together to study energy technology assessment in an effort to more effectively apply energy technology research into deployable technologies.
ò InfinitEnergy was the catalyst for several workshop and conference events that focused on promoting energy technologies as a means of economic development. Regional interests in biofuels and offshore wind energy are two results from these efforts.
ò The K-12 energy studies tool kit developed as part of InfinitEnergy is being used in some Coastal Georgia School Systems. The availability of these materials has also been disseminated for wider use via the web-site.

Contributions to Resources for Research and Education:

ò Significant contributions to Southeastern U.S. offshore wind development opportunities resulted from InfinitEnergy project studies. Collaborations with the National Renewable Energy Laboratory and the DOI Department of Minerals Management Services have included input for document development provided by InfinitEnergy studies.
ò Technology assessments encouraged and supported via InfinitEnergy provided data that allowed collaborative partners (industry, government, academe, etc.) to make informed decisions for implementation of energy related activities and investments in Georgia.

Contributions Beyond Science and Engineering:

Because energy has become such a major concern for the United States both in terms of higher cost and environmental impact, the InfinitEnergy Project was particularly beneficial and timely in its inception. Alternative energy is becoming a major factor in discussions in our Nation's capital and around the world. With the onset of climate change initiatives, heightened energy security, and the potential economic impact associated with high fuel prices and power generation costs, AET development will have a major role to play both in near term and long term decisions about the world's energy infrastructure. The InfinitEnergy Partnership has provided a unique model for successful collaboration between industry, academe, government, and the general public.

Categories for which nothing is reported:

Any Book
Any Product

InfinitEnergy (InfE) is an innovative and unique Coastal Georgia Partnership for Innovation formed to stimulate and promote innovation and economic development in alternative energy technologies (AET). It is accomplishing this through the development of a 'community-based' applied alternative energy laboratory located at the Georgia Institute of Technology's campus in Savannah, Georgia.

When proposed, the original project called for a three year term during which various objectives were established in order to reach goals over the lifetime of the project. Each year of the project heralded a new phase of activities which have been highlighted in NSF Annual Reports for Years 1 through 3 (see fastlane archive). The activities for each phase can be summarized as follows.

- Year 1: Efforts focused on two fronts: building a strong informational base from which to address regional economic potential; and gathering technological assessment data that complemented and reinforced project goals.
- Year 2: Efforts focused on expanding the base of support, implementing outreach activities, and beginning work on specific alternative energy projects identified via technology assessments undertaken in Year 1.
- Year 3: Efforts were focused on the expansion of independent AET projects and funding, publicizing any related activities/results of such project work and refining and growing educational and outreach activities.

It was determined at the end of year 3 that continued support for the expansion of newly established alternative energy programs in Coastal Georgia and beyond would enhance project outcomes. The request for a no-cost extension has allowed the *InfinitEnergy* Team to continue to make progress promoting innovative energy technology development and deployment in the Coastal Georgia region. In this final year of the project, efforts have focused on disseminating information via activities and events that reach beyond the coastal region while strengthening existing programs aimed at K-12 and public outreach locally.

In order to achieve its mission, *InfinitEnergy* focused on four major tactical action areas. These actions were outlined, by year, for each of the previous three years of the project under the following categories: 1) Learning and Knowledge Transfer; 2) Applied Research and Development; 3) Economic Development and Technology Transfer; and 4) Public Outreach and Promotion. As previously stated, within each of these tactical areas a strategic objective and a proposed end of project term goal had been identified. As reported in the Year 3 annual report, each of the established goals has been met and, in some cases, now moved beyond a regional focus. The objectives and goals are noted below.

1. Learning and Knowledge Transfer

- Strategic Objective: Establish sustainable, comprehensive learning programs around AET at the K-12, college, and university levels; and offer AET continuing education and job training courses to the community at large.
- 3-year Goal: Obtain and develop AET curricula and demonstration exercises for K-12, post secondary and professional development institutions.

2. Applied Research and Development

- Strategic Objective: Establish a sustainable program for fostering applied research and development related to integrating alternative energy technology into the fabric of our community.
- 3-year Goal: Establish an organizational structure to identify, seek funding, and successfully complete applied AET projects throughout Savannah and its surrounding areas.

3. Economic Development and Technology Transfer

- Strategic Objective: Establish a sustainable program that successfully promotes AET related economic development in and around Savannah, Georgia; and that facilitates technology transfer out of *InfinitEnergy*.
- 3-year Goal: Establish an alternative energy development zone in and around Savannah through tax incentive legislation and other economic development initiatives designed to attract AET related companies to locate in and around Savannah.

4. Public Outreach and Promotion

- Strategic Objective: Establish a sustainable public outreach and promotion program designed to increase awareness of AET, promote innovation across the various disciplines of AET, and promote economic development in Savannah.
- 3-year Goal: Establish Savannah as an "Alternative Energy City" with intent to promote widespread acceptance and use of AET and to encourage citizens in Savannah, the state and the nation to innovate and pursue careers in AET.

A major outcome of *InfinitEnergy* sponsored technology assessments included a two year research effort and the resulting publication of a joint feasibility study on the potential for offshore wind development in the South Atlantic Bight. This study was sponsored by Southern Company and lead by the Strategic Energy Institute (SEI) at Georgia Tech. As noted in the Year 3 annual report, SEI was initiated at the same time that the *InfinitEnergy* project began, and has become the umbrella organization for energy research at Georgia

Tech. A press release announcing the Southern Winds Project results was issued on June 27, 2007. The report will be available on the SEI web-site (www.energy.gatech.edu) by the end of summer 2007.

Additional activities and results that have occurred during the final year of *InfinitEnergy* include the sponsorship or participation in regional energy conferences including planning, presentation of materials and data, and marketing for broader economic impact. Three conferences that involved significant input from *InfinitEnergy* Team members are summarized below.

Southeast Regional Offshore Wind Power Symposium

SEI participated in the planning and sponsorship of the Southeast Regional Offshore Wind Power Symposium along with representatives from Clemson's South Carolina Institute for Energy Studies and North Carolina State's Solar Center. The event was held at the Embassy Suites in historic Charleston, February 26-27, 2007.

The goals of the Southeast Regional Offshore Wind Power Symposium were to:

* Increase awareness on the offshore wind potential of all three states.
* Educate key policy makers on the environmental and economic benefits of offshore wind power generation.
* Identify key political and social issues that must be resolved to establish offshore wind power.
* Develop a roadmap with a framework that will promote offshore wind power development in the southeastern coast.
* Promote educational interest in offshore wind power for undergraduate and graduate students in Georgia, North Carolina and South Carolina.

Infinite Energy sponsored the event by hosting a breakfast, and was so recognized. Other sponsors included the U.S. Department of Interior's Minerals Management Service, Savannah River National Laboratory, Santee Cooper, the South Carolina Energy Office, and Coastal Carolina University.

The Symposium brought together an outstanding group of experts and speakers to discuss the potential of offshore wind power in the Southeastern United States. Attendance at the event filled up quickly with 125 representatives from academia, state, local, and federal government, industry, as well as a large showing of utility representatives from the region. The attendance roster can be found online at http://www.clemson.edu/scies/WindAttendanceRoster.htm.

The symposium was noted as the first event in the country to highlight specifically offshore wind power. As an outcome of the event, a framework was started to encourage continued communication and growth of support for offshore wind power in the Southeastern U.S.

The presentations given at the symposium can be found online at:
http://www.clemson.edu/scies/WindProceedings.htm

National Conference on the Advancement of Research
Savannah, Georgia - April 11-13, 2007 (http://www.ncar.org/)

Energy Rx: A Prescription for Security,
Policy, and Research

National and international research leaders from government, industry and academia met in Savannah, Georgia, from 11-13 April 2007 to discuss and address issues on energy policy, security and research solutions. This important, high-level meeting was co-hosted by the Georgia Tech Savannah Campus and the Savannah River National Laboratory. This gathering marked the 60th anniversary of the National Conference on the Advancement of Research (NCAR).

The nature of the NCAR meeting attracted senior leaders from the R&D enterprise in the United States as well as abroad. They included vice presidents of research, major laboratory directors, policymakers, researchers, and other persons who have the power to shape the direction and performance of our nation's research enterprise. Since 1947, NCAR has developed a character based on four main features: informality, talks by eminent speakers, interactive discussions, and balanced representation from industry, academia, government, and non-profit organizations.

Southeast Bioenergy Conference 2006 (http://www.gabioenergy.org/)

SEI Team members participated on the planning board of this conference showcasing the growing industry of bioenergy in the Southeastern United States. Presentations included biofuels concepts developed as a result of technology assessments performed as part of the InfinitEnergy Program. Talks included:

- Building Your Bioenergy Business
- Forestry Energy
- Marketplace and Financial Issues
- Legislative & Regulatory Issues
- Green Energy and Green Power
- Energy Opportunities

Final Budget – All cost share has been met

InfinitEnergy - Summary of Project Budget and Expenditures							
	Chameau 6006625	**Participant Support 6006643**	**Frost 2726634**	**Shelton 13366AB**	**Parekh 0A7405000**	**Mavris 1606Y90**	**Total**
Personal Services	100,922	2,129	100,052	68,047	3,343	6,500	$280,993
Fringe Benefits	18,719	0	11,836	7,714	1,400	0	$39,669
Travel	8,973	0	116	5,323	5,430	0	$19,842
Materials & Supplies	19,276	900	429	152	59	0	$20,816
Subcontracts – Burdened	45,935	0	0	0	0	0	$45,935
Subcontracts - Unburdened	5,000	0	0	0	0	0	$5,000
Tuition Remission	3,774	572	12,402	8,941	123	1,920	$27,732
Total Direct Charges	202,599	3,601	124,834	90,177	10,355	8,420	439,987
Indirect (F&A)	95,826	0	55,878	40,212	5,439	3,211	$200,567
Grand Total	298,426	3,601	180,712	130,389	15,795	15,795	$640,554